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BY F. C. FINKLE.

INSIDE WIRING METHODS.
BY JOHN CARRELL.

INDUSTRIAL USES OF FUEL OIL.
BY F. B. DUNN.

UTILITY COMMISSION AS SAFEGUARD AGAINST CONSERVATION MEASURE.

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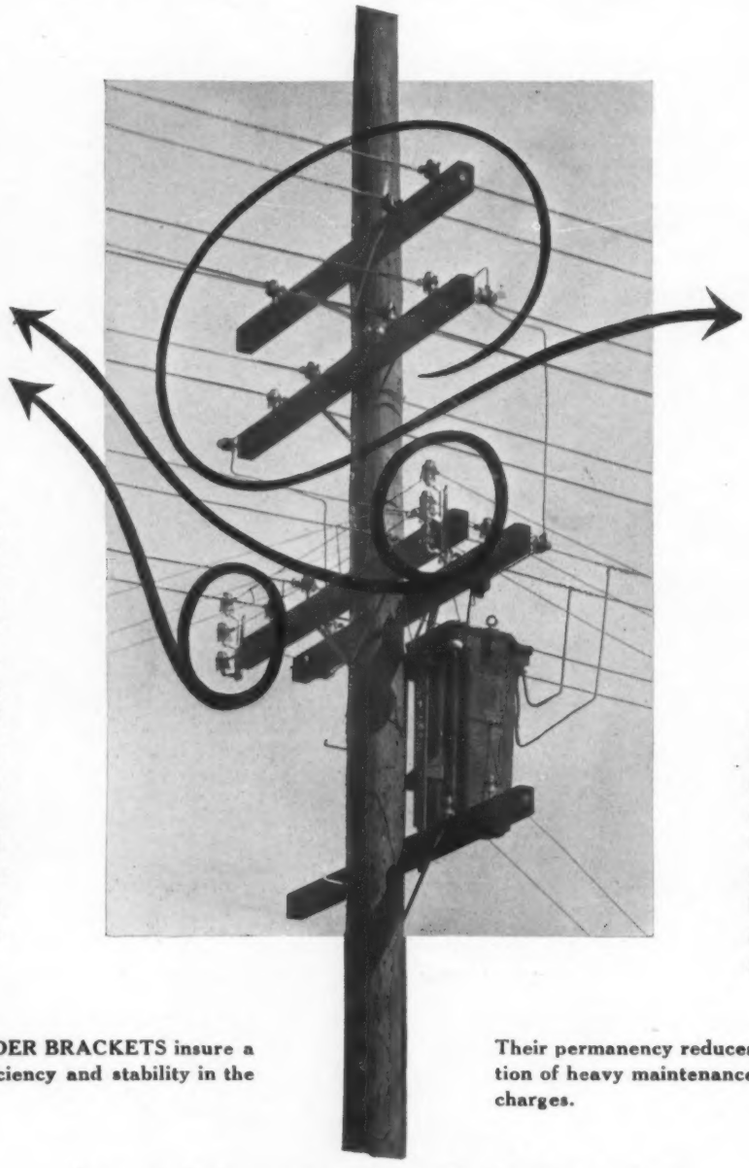

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VOLUME XXXIV SAN FRANCISCO, JANUARY 9, 1915 NUMBER 2

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LOS ANGELES AQUEDUCT MISTAKES

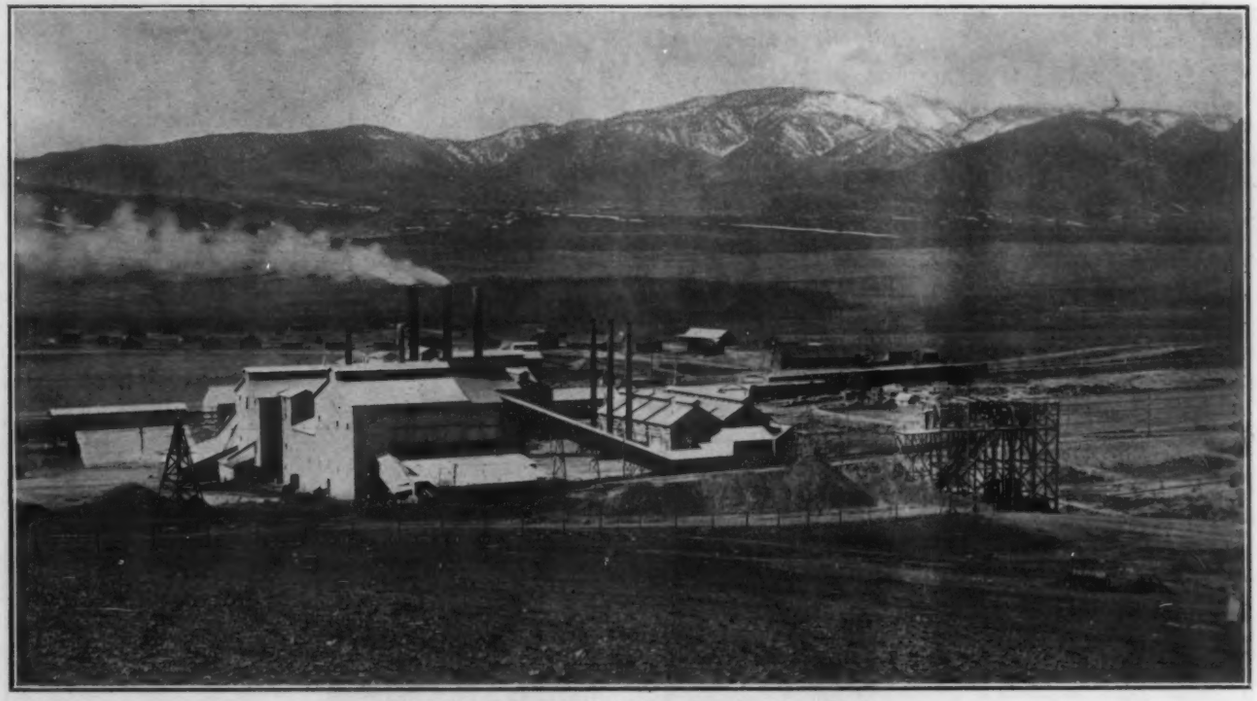
BY F. C. FINKLE.

(Substantial corroboration is here given to statements which have been previously made in these columns with reference to mistakes in the construction of the Los Angeles aqueduct. The pictures shown are selected at random from many similar photographs. Mr. Finkle is a consulting engineer at Los Angeles, a member of the Am. Soc. M. E., assoc. mem. I. I. E. E., and member of the Am. Water Works Assoc.—The Editor.)

The editorial on "What Was Wrong With Private Ownership" in your issue of December 1, 1914, was read with much interest. This taken together with the analysis of Mr. Warner's address at the Third Annual Conference of the League of Northwest Municipalities, on "What's Wrong With Municipal Ownership," is in my judgment the clearest analysis of these questions I have ever seen.

To obtain a practical illustration of the working of municipal ownership, carried to unreasonable extremes, you have but to look at conditions in the city of Los Angeles. The lack of business methods in the municipally owned and operated public utility work of this city is so apparent that there can be no dispute concerning the matter.

Mr. Jesse D. Burks, efficiency expert for the city, in addressing the board of public works on Friday, December 4, 1914, made the following statement: "One of the most pertinent examples of inefficiency under our present system is that, after the city brought to our doors the aqueduct water at a cost of $25,000,000 there is now no distributing system, and the city is carrying a charge of $1,500,000 annually, because no plans for distribution were made."



Monolith Cement Plant, Los Angeles Aqueduct.

Mr. Burks is right except that there have been nearer $40,000,000 than $25,000,000 invested and the annual charge, or loss, now carried by the city, is over $2,000,000. There have been $30,500,000 bonds voted, sold and the money expended on this project, to which must be added interest paid from city taxes, amount-

ing to several millions of dollars up to the present time.

There also have been voted $6,500,000 more bonds, which have not been sold, on account of the litigation concerning same, and the unsatisfactory state of the bond market. However, part of this money has

Sacks and Planks to Prevent Clay Ridge from Caving Under Bouquet Canyon Siphon.

actually been expended as it has been advanced from other funds of the city to be repaid, when these bonds are sold.

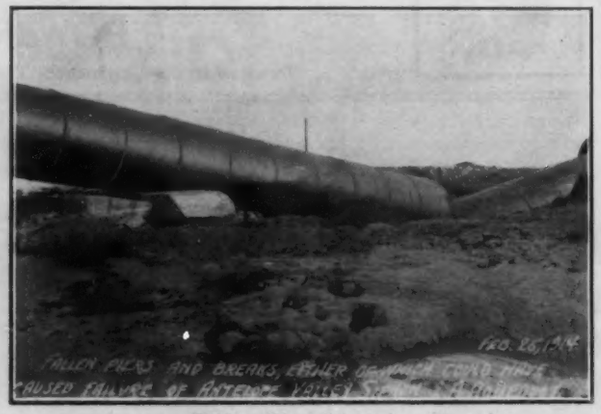
Throughout the entire history of the Los Angeles municipal construction on the aqueduct project there has been nothing but the most unparalleled inefficiency ever known. When the facts all become public, this example will become the most glaring one to

Franklin Canyon Pipe Line, Washed Out and Floated North of Sherman Valley.

demonstrate the unwisdom of conducting large enterprises of this kind by a municipality under the system of government now in vogue.

The writer will refer briefly to a few matters illustrating the experience in this city as follows:

The municipally owned cement plant was constructed to manufacture cement for the aqueduct. The operation of this plant has proved its inefficiency, as the cement from it was not only of inferior quality but cost between $2.75 and $2.85 per barrell at the mill. This is more than twice the cost for which the city could have purchased privately manufactured cement of the best quality. It was represented to the people of this city, that cement could be made at the plant



Fallen Pipe Supports.

for $1 per barrel and this fiction is still believed by many.

Recently Mr. Burks, the director of efficiency, believing the statement which has not been contradicted in regard to this cement plant, has demanded that the city operate same to supply the 300,000 barrels of cement used by it annually at a cost of $1.00 per barrel thereby saving half the cost of cement. He is not aware that cement cannot be produced from the city plant at much less than three times this cost per barrel.

Not only has the high cost of cement been a source of great loss, but its inferior quality has made the cement work on the aqueduct defective. It is hard to estimate the full loss to the city of Los Angeles, from attempting to manufacture municipal cement, but

Collapsed Antelope Valley Siphon.

it will run into several millions of dollars, before the story is completed. For the last two years the plant has remained idle, while the city purchased its cement, and the only hope of recovering part of the investment in the property lies in selling it to Los Angeles county, which the politicians are now attempting to manipulate, for the reason that the county has an overflowing treasury while the city funds are depleted.

Another illustration of the inefficiency in muni-

cipal undertakings is shown from the transportation of materials as conducted by the city for the aqueduct work. A large number of expensive and heavy caterpillar traction engines were purchased for hauling freight with the result that the cost of handling freight was nearly doubled. This was an experiment, at which the mechanical engineers in the city scoffed, before it was tried. In spite of this and in the face of its certain failure, the city attempted it, and the newspapers were filled with statements of the wonderful saving it effected and praise of city officials who had suggested it. It only took a few months to show

Location of Sand Canyon Siphon Destroyed by Break.

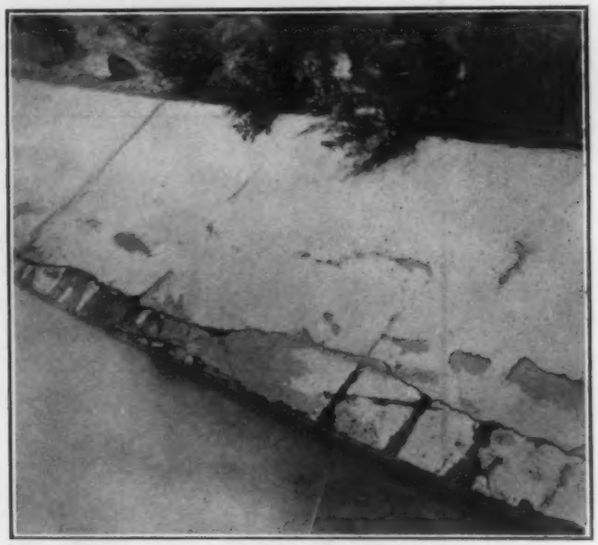
the impracticability of handling freight by this method, and the caterpillar engines were junked, after the city had sustained losses running into the hundreds of thousands of dollars.

Another, even worse experiment from an engineering standpoint, was the construction of the Sand Canyon Syphon on the aqueduct. For this experiment there was no excuse, as the Southern California Edison Company, in its Kern River Plant No. 1, had demonstrated that a concrete lined pressure tunnel in rock, such as we have in the southern portion of the Sierra Nevada mountains, could not be constructed successfully.

The writer was chief engineer for the Edison Company, when the construction of this tunnel was suggested. The original sugestion offered was to line the interior with concrete. After careful consideration the writer modified this plan by arranging on the inside of this concrete a steel lining three-eighths of an inch in thickness. This was done because it was foreseen that the pressure would cause the frail rock and the concrete to yield and produce cracks and abnormal leakage, which would wreck the work.

After the pressure tunnel with the three-eighths inch steel lining had been in operation for approximately nine months, a leak occurred in the seam of the steel lining, which caused water pressure to communicate directly with the concrete at one point. The failure to repair the leak promptly caused the pressure to compress the natural rock and concrete which produced a large leak and blowout. While it is probable that, had the leak in the steel lining been promptly repaired, the blowout would not have occurred, yet the experiment was a complete demonstration that a concrete lined pressure tunnel in such a formation, without steel on the inside, must be unsuccessful.

In spite of this the city of Los Angeles made an experiment, which resulted in the well known failure at Sand Canyon and the necessity of installing an entirely new steel siphon at that point. No private com-



Concrete in Lone Pine Section of Aqueduct.

pany would have made such an experiment, doomed to certain failure after the experience of the Edison tunnel in the same kind of rock formation.

Incidents without number, showing the partial or complete failure of methods and actual construction work, can be cited. The appearance of the concrete work, where exposed in the uncovered sections of the aqueduct, in piers under the siphons, etc., is such that one of experience in concrete construction will not hesitate to condemn it. Wherever there has been any use of the concrete with water flowing against it, under a velocity at all approaching rapidity, it has failed to respond to these requirements. Hence care has been used not to permit much water to flow through any portion of the aqueduct.

One of the most stupendous failures is the so-called Haiwee reservoir. This reservoir has failed to hold water and extensive work has been carried on to stop the leaks for more than a year past, but without success. During the present summer, newspaper interviews given by the chief engineer of the aqueduct, state that the reservoir has been filled with water. That it is water tight is the general belief of the public. But people from the city in considerable numbers have since visited the place and taken photographs, showing that these statements were false, and that the leakage instead of decreasing has increased, in spite of the fact that the water level is kept down to a low point, never having exceeded approximately thirty-seven feet in depth at the dam.

No sanitary investigations of the water were made, but the city rushed into the project without knowing the quality of the proposed water supply. The city officials in charge published the statement that pure snow water from the Sierra Nevada mountains would be obtained.

Now it develops that the intake of the aqueduct is located below the inhabited portion of the Owens valley; that over 40,000 acres of irrigated land returns its seepage to the river above the intake and that numerous towns of considerable size, such as Bishop, Big Pine and Independence are located so as to drain into the river and aqueduct.

Thus the available water is contaminated with the leechings from irrigated lands, including fertilizer, alkali and decomposed vegetable matter, the sewerage

Ditch Carrying Leak from South Dam. Also Showing Open Aqueduct Below South Dam.

and garbage from towns; the offal from slaughter houses; the drainage from pig pens, livery stables and corrals; the carcasses of dead animals, perishing in the swamps and on pasture lands along the river and aqueduct, or placed there for disposal after their death, etc.

Sanitary analyses at this time show the water to be impure after reaching the San Fernando Valley near Los Angeles. It contains nitrites, various forms of ammonia and bacteria in large quantities. Even if it be claimed that these elements will not instantly kill those drinking the water, nevertheless it is an unquestioned fact that a community cannot use impure water of this kind without gradually undermining the vitality of the people, so they will eventually become the victims of every form of epidemic disease.

It was not difficult to deceive the public in regard to the kind of water available from the aqueduct, by the reason of the great distance to the source of supply, and the fact that pure water could have been obtained, had the aqueduct been diverted from the tributaries of the river along the foothills, instead of from the main river in the Owens valley, after this has served as the outfall sewer of a populous section.

How could such state of affairs ever have been duplicated under private enterprise? Just conceive of a large project of this kind being constructed at a cost of approximately $40,000,000, with no provision made to utilize it, or obtain revenue; with an annual outlay for interest, sinking fund and maintenance, in excess of $2,000,000, and no plan or provision made for obtaining revenue to meet these expenses; and with an impure water supply, which cannot safely be used for domestic purposes in a community.

If there is anything which could reflect more on the theory of municipal ownership, it is the fact that certain newspaper owners and their associates, who wish to profit by obtaining water for large areas of dry land in the San Fernando valley, created the public sentiment for this project and caused it to be placed in the hands of incompetent men, who would do their bidding.

The fact that the point of diversion was located where the water is contaminated, may be more than an accident, as the logical solution to be offered must be that, after all, this water can only be used for irrigating the lands of these newspaper owners and their associates, as it is not fit for domestic consumption.

That the construction work is inferior is small wonder, for the estimate of cost was made on the basis of the amount of bonds, which could be issued by the city of Los Angeles, without exceeding the legal limit, and the work was placed in charge of men, whose qualifications consisted in receiving the praise of the interested newspapers, whom they were serving. None of these things, not even the "tissue paper construction work" could have happened under anything but municipal owenrship.

A MUNICIPAL OWNERSHIP ABSURDITY.

The fallacy and absurdity in the following citation would be laughable were it not for the fact that it is an actual proposal which was recently made to the City of Medford (Oregon):

Medford, Oregon, October 3, 1914.

To the Honorable Mayor and Members of the City Council of the City of Medford:

We wish to submit the following statement, as a possible solution of the lighting and power trouble which the city of Medford finds itself involved in.

Estimated cost of municipal power plant, including the following:

One 1200 h.p., 1600 kw. generator; one 1200 h.p. internal combustion motor; switchboard, buildings and distributing system—$125,000.

This plant would have an estimated output of 1600 kw. per hour or 38,400 kw. per 24 hours.

Plant to be paid for by sale of bonds to the amount of $125,000. Bonds to be 5-20s, bearing interest at the rate of 7 per cent and the expense account, as shown by the following estimate will be found adequate for all expenses.

Bonds, $125.000. Interest, 7 per cent, which would make the bonds O.K. locally. Sinking fund 5 per cent, which is 1½ per cent too high. Depreciation 10 per cent, which is at least 7 per cent too high. Total 22 per cent, estimated expense on a per cent basis.

Twenty-two per cent of $125,000 approximates $75.00 per day. Operating expense (labor) $50.00 per day, which is too high. Estimated fuel expense (gas) $115.20 per day. Oil and other expenses $9.80 per day. Total estimated expense, $250.00 per day of 24 hours.

Output 38,400 kw. per 24 hours. Estimated cost per kw. 3/5 of one per cent. Ordinary efficiency would greatly reduce this cost. Results: At 2 cents per kw. this plant would be a paying investment. A 5 cent rate with a 50 cent minimum would be one of the best advertisements for the city of Medford that it would be possible to get.

We are now paying about the highest rate on earth, i.e., 10 cents.

With this amount of consumption of gas per day to drive said plant (288,000 ft.) a gas rate of at most $1.00 per thousand is assured for domestic use as against $1.50 and $1.75 at present.

This would make Medford a very desirable place to live from a fuel and lighting standpoint, besides creating a payroll by the development of other resources in the neighborhood of Medford.

Bonds for the purpose of building a municipal light and power plant for the city of Medford—total issue $125.000.

Bonds to be issued in small denominations ($10.00 and multiples of same.)

Bonds to be accepted as payment for light and power to the extent of 50 per cent of said light and power bill at the rate of 102, which would keep the market price of the bonds above par and would automatically retire same in a short time.

This taking of bonds, as part pay for all light and power bills at the rate of 102 would create a local market for the bonds and give them a buying power which would make them legal tender for a great many bills.

At the same time, by retiring a bond at 102, the city has saved at least 3 per cent in the sinking fund, besides reducing the interest account and keeping the power above par.

We are only submitting this statement as an estimated cost of said plant but should the mayor and city council of the city of Medford wish further information, we will be glad to submit same.

We feel sure that we have estimated the cost of said plant high enough and the cost of operating same, too high, providing ordinary care is exercised in the building and operating of same.

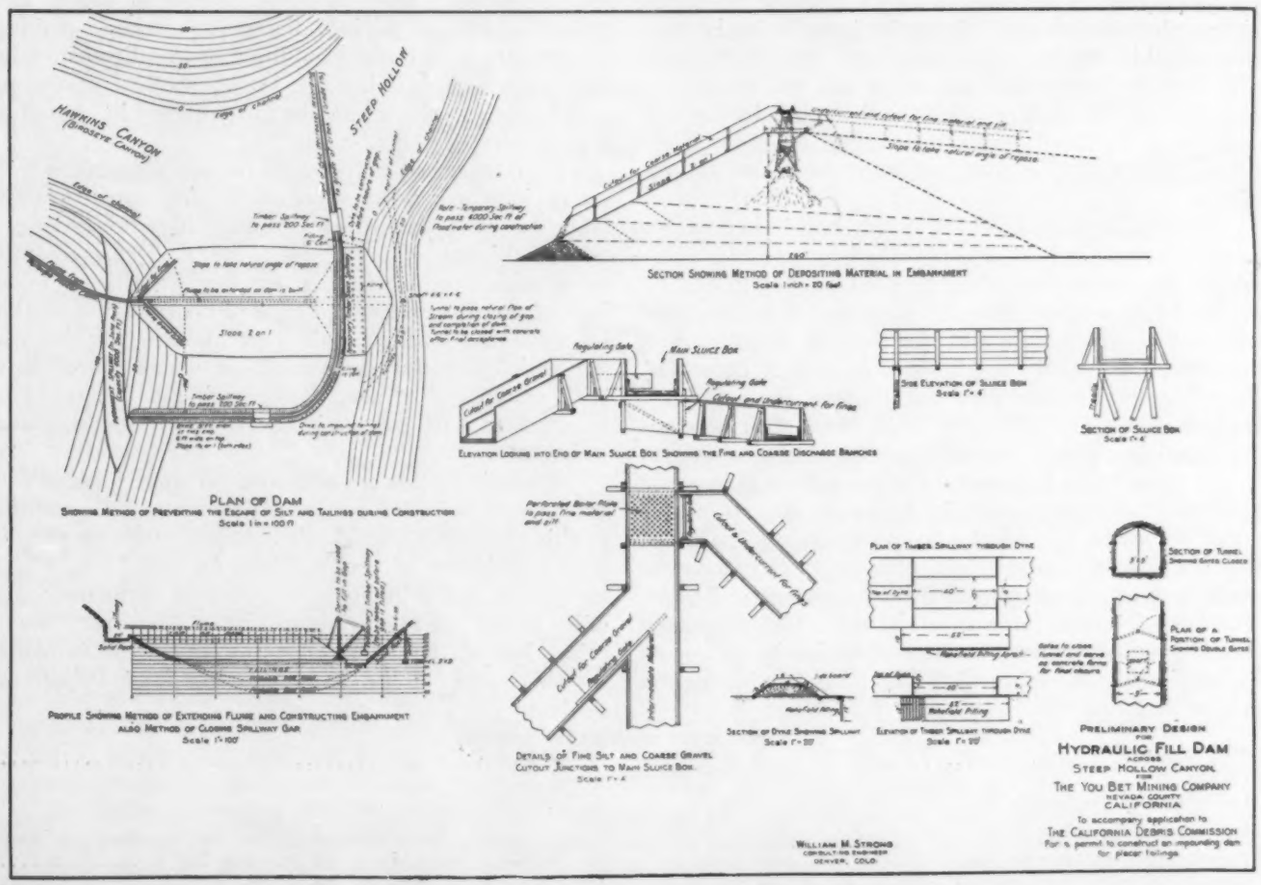
Respectfully submitted by the Directors and Secretary's office of the Medford Chamber of Commerce.

(Signed) DELBERT FEHL,
Secretary Medford Chamber of Commerce.

A HYDRAULIC FILL DEBRIS DAM.

The restrictions imposed on hydraulic mining by the California Debris Commission require that all tailings be permanently impounded. As a means whereby this might be effectively and economically accomplished the method indicated in the accompanying drawing was devised by Wm. M. Strong, a consulting engineer of Denver for the You Bet placer mines in Nevada county, California. The design is so unique as to be of interest to engineers in general.

A preliminary survey located a canyon in a favorable site for a dam capable of impounding five million cubic yards of placer tailings. At this site it was possible to construct the dam of gravel hydraulicked from a gold-bearing location, crediting the construction cost with the gold production. The engineering methods by which this can be accomplished are evident upon inspection of the drawing.


HAWKINS CANYON
STEEP HOLLOW
PLAN OF DAM
SECTION SHOWING METHOD OF DEPOSITING MATERIAL IN EMBANKMENT
PROFILE SHOWING METHOD OF EXTENDING FLUME AND CONSTRUCTING EMBANKMENT
DETAILS OF FINE SILT AND COARSE GRAVEL
PRELIMINARY DESIGN FOR HYDRAULIC FILL DAM ACROSS STEEP HOLLOW CANYON FOR THE YOU BET MINING COMPANY NEVADA COUNTY CALIFORNIA
WILLIAM M. STRONG
CONSULTING ENGINEER
DENVER, COLO.

Design for Hydraulic Fill Dam.

INSIDE WIRING METHODS

By JOHN CARRELL

Figuring Quantities.

Clear heads are essential for estimating work. Leatherheads are useful accessories. The latter are placed on nails to protect porcelain knobs from injury; but estimators may use them to keep nicks out of their dispositions.

With floor plans spread out, place a leatherhead on each outlet until all are covered and then count the leatherheads. If plans do not show outlets arranged on circuits, place leatherheads with smooth sides down until 660 watts are taken up; write the number "1" beside each outlet lightly, with colored pencil; turn the leatherheads over with smooth sides up, and proceed with circuit No. 2 in the same manner.

When all the outlets are filled up and numbered see if any can be traded between adjacent circuits to secure a better wiring advantage.

The count of the leatherheads should proceed according to the method used to classify outlets. For example pick up those on ceiling outlets first and count; next those on brackets; next plugs, etc. Switch outlets should be treated separately, or, better still, different devices should be used for them, such as small copper washers. The completed count will be accurate and the difficult part of laying out wiring for branch circuits will be finished.

The next point of importance will be to discover the most advantageous number of centers of distribution and the locations thereof. If this feature has not been treated by the architect proceed to count and number outlets until the entire installation is complete in this respect. The required service capacity will then be known and the main and sub-centers of distribution, as well as the service and feeder circuits, may be intelligently considered from the view points of installation cost, potential drop and accessibility.

Measuring distances for single braid wire or for metallic armor is best accomplished by use of a rotometer, or measuring wheel geared to a register by means of an endless screw. This device is equipped with a dial which indicates the number of feet measused on plans, usually for both ¼ in. and ⅛ in. scales. To aid in guiding the measuring wheel the estimator conjures up a mental picture or, if the circuit be complex, makes a rough pencil diagram of the wiring as it will actually be installed. But from floor plans only horizontal distances can be taken so an allowance must be made for wiring in walls. For knob and tube or armored cable work the allowance may be made in total, proportionate to the number and classification of outlets; for conduit work the allowance should be made separately for each point in each wall, by turning the wheel until the dial hand indicates the proper distance.

To record quantities so that materials may be easily priced and, at the same time, so that proper amount of labor may be deduced therefrom, is desirable. For example, outlets would be recorded in divisions about as follows: (1) combination outlets; (2) straight electric ceiling outlets; (3) straight electric bracket outlets; (4) single pole switches; (5) three-way switches; (6) plug receptacles; (7) miscellaneous outlets, to include four-way switches, waterproof floor outlets, door switches, etc.; (8) special outlets.

More time is required to set boxes for straight electric outlets than for combination outlets because, in the first case the wireman must find locations and usually provides backings, while in the second case he may not do either. The time required to set boxes for straight electric brackets varies more with conditions of job than does that for ceiling outlets. Plugs and switches are logical divisions while the miscellaneous division is to cover outlets not found in the usual run of work. The special class is for outlets designated by the special symbol adopted by the A. I. E. E.

Wire and metallic armor would be recorded as to size and as to division of work, i.e., for branch circuits, feeder circuits, etc. Material used accessorily to that on which quantities of labor are computed are approximated proportionately to either wiring distances or number and classification of outlets, i.e., outlet box accessories, porcelain knobs, etc., proportionate to outlets; pipe supports, porcelain tubes, etc., proportionate to wiring distances; flexible tubing, proportionate to outlets modified by conditions on job such as where switches are set on shallow partitions, or where difficulty would be encountered in approaching centers of distribution.

Constant time units based on averages taken from many jobs are used successfully for approximating labor on such quantities as outlet boxes (classified), small cabinets, No. 14 wire, branch circuit conduits or on which the work does not vary greatly for buildings of the same class and type of construction. Labor for variables, such as main switchboards, service wiring which requires excavation, or where labor varies with conditions of specifications or job is figured by comparison with some similar actually executed construction.

Quantity totals are extended on some form of estimate sheet and filed for future reference. In addition to this, estimators, as a rule, compile notes on the different divisions of the building for use in case of a successful bid, principally to compare estimated costs with actual costs during progress of work. Something better than scratch paper should be furnished for this purpose, the accompanying form being convenient:

FORM FOR ESTIMATE SHEET.

Job. Number..... Class.....
Owner..... .....
Location..... .....

Division of Work.	Chart No.	Material. Description.	Quantity.	Unit.	Price. Amt.	Unit.	Labor. Da.	Hrs.	Unit.	Price. Amt.
Combination outlets, 3d floor....	....	No. 1900	100	.20	$20.00	32	3	1	....	.....
Straight electric brackets, 3d floor	....	8 BO	16	"	3.20	16	1	..	....	.....
S. p. switch boxes, 3d floor.....	....	15	72	"	14.40	24	3	..	....	.....
½ conduit, 3d floor.....			2800	.05	140.00	90	31	1	....	.....

INDUSTRIAL USES OF FUEL OIL

BY F. B. DUNN.

(Continued.)

Oil in the Lime Industry.

Lime is an oxide of calcium (CaO), and in one form or another is the basis of all mortars and cements. It is produced commercially by heating common limestone in specially constructed kilns. Fig. 50 shows a modern type of continuous oil burning lime kiln.

Limestone is calcium carbonate, $CaCO_3$. When heated to high temperature, it gives up carbon dioxide, which passes off as a gas, and oxide of calcium, or quicklime, remains. Carbon dioxide begins to come

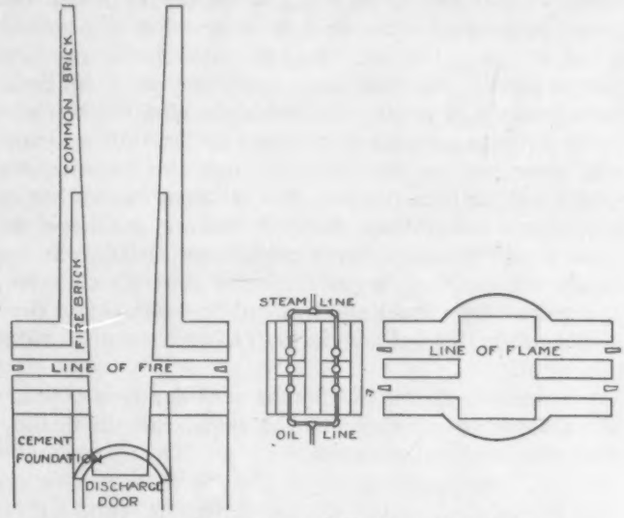


Fig. 50. Continuous Oil Burning Lime Kiln.

off at about 750 degrees F., but a temperature of over 1300 degrees F. is required to completely reduce the stone to calcium oxide. Commercial limestone nearly always contains considerable quantities of moisture and organic matter, which are driven off in the burning process. Clay, magnesia and iron oxide are other impurities often present, with the result that the actual yield of lime may vary from 55 per cent to 30 per cent or less of the stone.

Dense, compact stone is reduced with great difficulty, but the best quality of lime is produced from such stone. The lime-kiln should be charged with lumps of stone uniform in size, about as large as a man's head. If the pieces are too large, or the temperature of the kiln too low, the lumps will not be calcined to the center, and the lime will not slake. The diameter or width of the kiln when oil fuel is used, should not exceed eight feet at the burning zone; if it is greater than this the heat of the flame may not penetrate to the center of the rock. Care must be taken in arranging the burners and fire box. The chamber should be large enough to allow combustion to take place before the oil enters the kiln. This insures a soft, long, flame, permitting the gases to pass readily to the center of the kiln. If the burner is placed too far in, carbon is liable to form as a result of the flame impinging on the rocks. Furthermore, the lime near the flame is overburnt, while the lime in the center of the kiln is not burnt enough. The burner should be so constructed as to thoroughly atomize the oil, and where possible a low pressure air burner should be used.

Air for combustion should be admitted around the burner, so that it will pass through the flame and thus insure complete combustion. Some lime kilns have been arranged to take the air for combustion from the stack by means of a steam siphon. Good results have been obtained by this method, as the flame is much softer and longer, and the volume of gases increased. These gases pass through to the center of the kiln, and when they carry a sufficient amount of carbon monoxide, secondary combustion takes place there.

Lime burning has been carried on in many types of kilns, most of which can be readily converted to the use of oil fuel. Oil burnt lime finds a ready market because of its cleanliness. The continuous type of lime kiln has proven to be the most successful with oil fuel; the rotary kiln has also been used with good results; but in this kiln the stone is broken into small pieces with the result that the lime produced is not

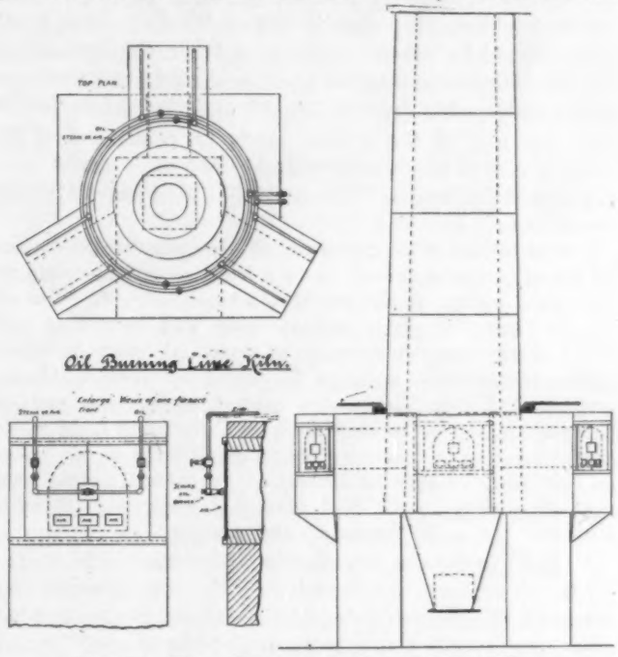


Fig. 51. Shurs Burners Applied to Lime Kilns.

adaptable for building purposes. On the other hand, when lime has to be ground and hydrated, this type of kiln saves considerable power that would be consumed in grinding.

The following reports illustrate clearly the difference in the nature of the rock obtained from different localities.

Report on Lime Kilns in Texas and Mexico.

	Texas.	Mexico.
Total lime burnt in 24 hours....	40,000 lb.	30,856 lb.
Total oil consumed in 24 hours..	4,960 lb.	6,048 lb.
Barrels of lime (230 lb.).....	174 bbl.	129.8 bbl.
Barrels of oil.....	14.76 bbl.	18 bbl.
Gallons of oil per ton of lime....	31 gal.	54 gal.
Tons of lime per 24 hrs.....	20 tons	Metric tons, 14
Lime burnt per ton of coal as formerly used in gas producer	5	
Oil equivalent to one ton of coal	3.69 bbl.	
B.t.u. of oil.....	18,600	18,500
Oil pressure at burners.....	40 lb.	40 lb.
Steam pressure at burners.....	80 lb.	80 lb.
Temperature of oil at burners...	120° F.	110° F.

(To be continued.)

UTILITY COMMISSION AS SAFEGUARD AGAINST RADICAL CONSERVATION MEASURE.

Retention of the public utilities commission as a means of offsetting federal control of Idaho's resources is advocated by Senator Borah in a letter just received from him by C. F. Koelsch, representative-elect from Ada county. Senator Borah points to pending national legislation and shows why a public utilities commission will be necessary for the state if such legislation is to be passed in order that the state may combat a radical conservation policy. His letter is as follows:

December 14, 1914.

My Dear Koelsch:—I have observed for some time suggestions in the public print and elsewhere looking to a possible repeal of the public utilities law of the state of Idaho. I do not assume that any such step will be taken. Nevertheless, in the consideration of the question it has occurred to me that it might be well to consider the relationship between the Western states and the general government owing to the conservation bills which are now pending before congress.

The necessity for a public utilities law in our state seemed to me at the time it was under discussion much accentuated by reason of these conservation questions.

To illustrate, there is now pending before congress a bill to provide for the development of water power and the use of the public lands in relation thereto. This is one of the conservation bills and is based upon the leasing principle. In this bill I find the following provision:

That in case of the development, generation, transmission, or use of power or energy under a lease given under this act in a state which has not provided a commission or other authority having power to regulate rates and service of electrical energy and the issuance of stock and bonds by public utility corporations engaged in power development, transmission and distribution, the control of service and of charges for service to consumers and stock and bond issues shall be vested in the Secretary of the Interior or committed to such body as may be authorized by federal statute until such time as the state shall provide a commission or other authority for such regulation and control.

Passing by the constitutional question which may be involved, and the constitution is not of much moment in conservation legislation, apparently, and assuming that this bill is to pass and the leasing system by which royalty is to be extracted from a few states is to be fastened upon us, it becomes of great moment for us to retain as much control over our situation as is practicable. I do not presume that the people of our state would desire to have their rates fixed or their domestic affairs regulated and controlled by a federal officer two thousand miles away, at least I am not in favor of such policy.

There are many other provisions in these bills to which I might call attention illustrating the view which I entertained that it was exceedingly important that we have an efficient and serviceable public utilities law. I feel sure that it will be of great advantage to any state that has it under the conservation legislation which it seems probable we are to pass.

I am much opposed to the leasing system, covering as it is now intended all of our natural resources, not only because in my judgment it will retard the development of the state, withhold from taxation a vast amount of property which ought to be taxed, but because the royalties which will be collected will ultimately be passed over and charged up to the citizens of the state and will constitute in its final effect a new tax and a new burden laid specially and alone upon the public land states. But I am of the opinion that such a system, is going to be tried and that these bills will be ultimately passed and I feel quite certain that we will find a public utilities law and an efficient public utilities commission of vast service to us under such circumstances.

There is another feature of the controversy and that is as to the legal right of the national government to fix rates to be charged for power where the power is used wholly within the state. I do not believe it can attach to the leasing of its public lands any provision which will take away from the state its right to regulate and control its domestic affairs. But one thing is quite certain, that unless we had some means and some method by which to test the question we would not be in a position to challenge the authority of the national government. Moreover, I believe the state would not want these public service corporations to go without any regulation and control whatever, and unless we had an efficient public utilities law they would prefer federal regulation rather than no regulation at all.

I merely suggest this for the consideration of yourself and other members of the legislature in dealing with this important matter.

Respectfully yours,

W. E. BORAH.

LETTER TO THE EDITOR.

Los Angeles Aqueduct Mistakes.

Sir:—I have been much interested in reading the discussions in your Journal relating to municipal ownership. In the issue of December 26, 1914, there are some statements in the communications signed by Messrs. Stocker and Scattergood, which require attention.

The former states that criticizing the Los Angeles aqueduct is a reflection on the engineering profession, because the project was conceived and carried out by engineers. Mr. Stocker is entirely wrong. The project was initiated by real estate speculators, who included the proprietors of the leading newspapers, as they were all interested together in the San Fernando land scheme.

Because Mr. Eaton, who was the moving spirit in the matter, was once an engineer, does not say that it was an engineering undertaking. Mr. Eaton had long since ceased to practice engineering and had become a noted politician before the aqueduct was launched. Nor does it follow that engineers are always free from mistakes. The most severe criticisms I have ever heard of Engineer Mulholland, have come from members of the profession in high standing, some of whom have stated that his engineering reputation was created by the newspapers and politicians who wished to make use of him.

The fact is well known that the aqueduct, at its inception, was merely a land irrigation scheme de-

signed to enrich certain speculators at the expense of the public. It has not added any pure water to the city supply of Los Angeles nor any income to the water department. His assumption that the work is completed and can carry a full supply of water is not warranted by facts, as the aqueduct has never as yet been fully thus used or tested.

Now, as to Mr. Scattergood's praise of the Los Angeles Water Department, let us look at the facts. The water system has been owned by the city for twelve years. During that time the meter rates charged for water have not been reduced, notwithstanding the business has grown to three or four times its original volume. Flat rates were slightly reduced once and that was about eight years ago, while during these eight years the business has been more than trebled.

This is certainly not a record of which Los Angeles should be proud, because during the same time other public utility service, such as gas and electricity, wholly controlled by private corporations, has been repeatedly reduced in price, until gas is selling for less than one-half what it was twelve years ago and electricity for about one-third of what it was twelve years ago. While the earnings of the water department show that the rate should have been reduced to one-third of the rate charged if justice had been done.

Mr. Scattergood's assumption, that the reduction in electric rates is due to the effect of the threat of a municipal plant, may be erroneous. Those who are thoroughly familiar with conditions on the Los Angeles aqueduct seem to see the impracticability of carrying on electric service with a water power plant dependent on this aqueduct and without an auxiliary steam plant, and some look upon the whole thing as a huge joke, which cannot frighten the private companies in the least.

Mr. Scattergood and some of the politicians who are manipulating the city electric power bureau may or may not take the matter seriously, but, if they do, they are about the only people connected with the electric business who do so, so far as I have been able to judge after conversing with them.

It is a poor argument to say that services of one kind is cheaper in one city than another. Conditions may be so different in cities, that this may account in a great measure for the difference in cost. In Los Angeles the water supply has been obtained from a river owned and controlled by the city and the expenditure, other than laying pipes and conduits, is very light, in fact the showing made by the management, gives an earning of more than million dollars a year after deducting expense of operating, maintenance and depreciation. If this earning was deducted from the rate now being charged there would be little need of comparison of rates with those of privately owned utilities, who have often acquired water properties at great cost, constructed storage reservoirs at enormous expense and whose stockholders must have annual dividends after extension of service has been paid for, in a growing city. The earnings of the Los Angeles Water Department do not go to stockholders, the public—the water users do not get them, they have been and are being diverted to the enhancement of private values; more than a million and a half has been diverted to the construction of irrigation works outside of the city which are to be used for irrigating privately owned lands.

Had last year's earnings been used as dividends they would have paid about 50 per cent upon the original cost of the entire system. As it is we have the owners—the users—submitting to a tax which is being diverted from them with no hope of return under the present method of management.

Respectfully, H. A. HART.

Los Angeles, Cal., Dec. 29, 1914.

SPAIN SEEKS FOREIGN ELECTRICAL EQUIPMENT.

Consul Wilbur T. Gracey, of Seville, advises that the meeting recently held by the Fomento del Trabajo National, which was called together to adopt measures to meet the present grave crisis in the electrical goods market, decided to obtain from the government a tariff reduction on all electrical materials manufactured outside of Spain, by means of a regulated tariff, to ask the government to make inquiries through the various ambassadors abroad which country is best able to supply these materials; at what prices, and on what conditions; and to ask the help of representatives of foreign houses in ascertaining if their houses can supply materials and the prices thereof.

This action would appear to show a special interest in the Spanish purchase of electrical goods at this time, and American manufacturers would probably do well to get in touch with interested parties as soon as possible.

THE NEW WHITE COAL.

BY CHARLES HESTON PEIRSON.[1]

Oh, peaks of the grand Sierras, that lift your heads so high
That the drifting snow of the winter clings 'neath a summer sky;
Oh, peaks of the High Sierras, where the fleecy cloud banks roll,
Do you know that the snow which you cherish is known as "the new white coal"?
Do you know that when it leaves you, trickling away in the sun,
That it goes on a mighty mission, and its task is just begun?
Do you know that when it leaves you, to course down your rugged sides
Forming the stream and the brooklet and the river's roaring tides
That its rush is the power of the turbine, that generates the spark,
Which is carried away and away on the wire dispelling the night and the dark;
That it drives the busy factory where once the chimney loomed;
And quiets the noisy engine that puffed and fretted and fumed;
That it cooks in the cottage kitchen; and warms where the family meet,
And does those things which coal did do when it was our light and heat?
Oh, peaks of the High Sierras, where the cloud banks softly roll,
Cherish the snow on your icy crests that is known as "the new white coal"!

[1]Southern California Edison Company, Los Angeles.

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Cost of Service

Although attention has been frequently called in these columns to the necessity for a cost of service basis for public utility accounting much remains to be written upon the advantages of this principle. Objection has been raised that it adds greater complexity to existing methods of utility accounting, but it should be remembered that the road to simplication must pass through the rough ways of complexity.

The accounting methods prescribed by most of the public service commissions do not readily lend themselves to one of the prime purposes of these commissions—that of finding the cost of service upon which the rates for that service are to be predicated. Furthermore the operating companies now realize that efficient management is dependent upon an adequate record of operating costs. Nor is the day far distant when regulation of expenses will be as important a function of commission as regulation of rates.

Many of the deductions which may be made from the financial accountings of electric light and power companies are of little avail in increasing the efficiency of operation. Yet a slight change in the method of recording will give to the manager a valuable guide for future conduct of business. For example, the average cost per kilowatt hour obtained by dividing the total cost by the number of kilowatt hours generated means little as to means for reducing the cost, whereas specific unit costs of each step in the several processes by which current is delivered to the consumer give proper guidance as to the cost of that service and how it can be reduced.

Great importance attaches to this matter of proper choice of unit cost items. Many overhead expenses cannot be logically classified under a "cost per kilowatt" heading. Labor costs, also, should be assigned to the items with which they are directly connected. The absurdity of classifying the expense of meter reading on the kilowatt hour basis is manifest, as is also the cost of collecting money. How much more can be learned as to real efficiency and actual cost if the more practical unit of cost "per meter in use" is adopted. This is merely illustrative of classification items which should be adopted in many other accounts.

Much work is yet to be done in selecting standard units of cost which will conform with operating conditions and give information which will enable the executive to intelligently direct his organization to higher efficiency. The usual forms prescribed for public utility accounting do not show the difference in the cost of serving lighting and power consumers, peak and off-peak users, and many other classes of service. Slight changes in present methods of classification would give greater flexibility and would present the information which is necessary for intelligent rate making based upon the cost of service. This would not require the abolishment of the present classification but merely the addition of supplementary headings that would bring out specific costs.

Accounting, in general, is the history of a business. Cost accounting, in particular, is a more minute history of a process in that business. There is no con-

flict between the two, each has its part in the conduct of a business. Trying to find the cost of service from the usual financial statement of an accountant is as difficult as trying to pick up a shining drop of quicksilver. You put your finger on it, and it is not there. Modern accounting is useful not only as a financial record of past performance but also as a scientific basis for future operations. The discovery of the future is based upon the records of the past.

Pipe Line Utilities

"Give me to realize always what is time," was the prayer of one man who left this world better by his having lived in it. A realizing sense of the value of time is something that can be acquired by every thinking man—if he will take time to think.

This does not mean that we need to hurry our work, but on the contrary we should frequently rise above its petty details so as to survey it in its entirety and determine whither it is tending.

In our modern life, with its ever-increasing load of detail, most men are overcome by routine. Their industry and application are misdirected and inefficient because they are blind to the true purpose of their efforts. They imagine that they are too busy to think, too busy to take time to learn from the successes and failures of other men.

Take time to think. Get a new viewpoint. Look at your work from the outside. The desk view is myopic. The concave lens of leisure is necessary to study the true perspective of your work. What you do not do this year you can perhaps do next year; but if you are always rushing after various details you cannot concentrate on essentials. Concentration is the secret of power. It takes time and thought to focus energy.

How often have we heard engineers say that they had no time to read their professional journals! To whom have they sold their time that they cannot use it to their own advantage? In return for their time what have they received that is more valuable than knowledge of the ideas and achievements of others which might be applied to the solution of their own problems?

O slaves of time! Your emancipation has long been proclaimed and it remains only for you to dispose of your time as you wish, thus, and thus only, demonstrating that you are your own masters. Time is but an arbitrary measurement of duration, an empirical division of sequences. Success in its use is not determined by the number of hours of labor, but by the intensiveness of the mental effort and by the tangible results we have to show. In the end, results are all that count.

And in the proper application of time to get desired results it is not enough merely to fight, nor is it sufficient to be brave. There must be a pleasure in the fight, a joy in the struggle. "We do those things well which we like to do." Life is a fight where our chief opponents are not men but conditions. Conditions, being without intelligence, yield with just enough resistance to keep our muscles in good trim. Being in the fight, however, it is imperative that our resources be conserved, used wisely, and of these resources time is the most precious.

The Value of Time

The California Railroad Commission has just decided that oil pipe line companies are common carriers and public utilities which will hereafter come under its jurisdiction. This decision is in line with those made by other commissions and now needs only the approval of the State Supreme Court regarding the constitutionality of the pipe line act.

Strict analysis shows that a pipe line partakes of the nature of a public utility in every respect, whether transporting crude oil from the fields to the refineries or to the seaboard. It is the only efficient means of conveying oil to the market. It gives the pipe line owners, who in California are also the biggest oil producers, the opportunity to dictate prices to the smaller independent producer and thus control the oil production. Modern thought dictates that such power should be exercised only under the jurisdiction of a commission which has authority to regulate rates, service and security issues.

The decision has long been anticipated by the several companies which are affected. It is difficult to foretell the effect which it will ultimately have on the entire industry, although the smaller producers regard it as a victory. The European war has demoralized prices, as the demand has been curtailed, prices now being ten per cent less than they were about a year ago. Every effort has been made to cut down the production so as to equalize supply and demand. This condition is temporary and will soon be relieved in the world-wide adjustment which the war will bring to every industry.

If commission control of pipe line companies will give oil securities the same stability that it has imparted to those of other utilities the new arrangement should greatly help the oil men. This control is even more direct than can be exercised under the provisions of the recently enacted "blue sky law," and should be effective in creating greater confidence in the mind of the investor.

While on the subject of commission regulation it is of interest to note that Frank B. Devlin has been named by Governor Johnson to succeed to the vacancy on the California Commission caused by the election of John M. Eshleman as Lieutenant Governor. It is believed that a worthy successor has been found to fill the void which is created by Mr. Eshleman's promotion, though it is greatly to be regretted that the opportunity has been lost to put an engineer on a board which must regulate matters which are essentially engineering in their nature. Mr. Devlin, like Mr. Eshleman and the other commissioners, is a lawyer. In this respect the California Commission is overbalanced. No criticism is thus implied of Mr. Eshleman's excellent record as president of the commission, the suggestion merely being in line with that already made in these columns that every public service commission should have at least one member who is an engineer.

PERSONALS

D. K. Nogle of the Monterey Electrical Works spent a few days at San Francisco during the week.

A. Peck of the Electric Supply Company, Sacramento, spent a few days during the holiday season at San Francisco.

M. Elzia, manager Central States Electric Company, Fresno, spent several days during the past week at San Francisco.

F. L. Jepson, formerly in the electrical business at Pasadena, has joined the sales force of the Illinois Electric Company at Los Angeles.

S. P. Russell of the sales department H. W. Johns-Manville Company, San Francisco, is on a business trip through Northern California and Nevada.

T. O. Dowdell, who recently purchased the electrical business of Bernard & Roberts at Suisun, was a visitor at San Francisco during the week.

E. L. Barnes. district manager of the American District Steam Company at Seattle, is attending the annual meeting of the company at Tonawanda, N. Y.

F. H. Poss, Pacific Coast representative for the Benjamin Electric Manufacturing Company, will leave for a short visit to the company's Chicago offices this week.

Frank R. Devlin has been appointed a member of the Railroad Commission of California, succeeding J. M. Eshleman, who was recently elected lieutenant governor.

P. B. Hyde, heretofore Western representative of the primary battery department of Thos. A. Edison & Co., has left San Francisco to assume new duties with the works at East Orange, N. J.

R. H. Coyne, formerly with the Kellogg Switchboard and Supply Company at Chicago, has assumed the management of that company's Western business, with headquarters at San Francisco, succeeding **H. C. Goldrick,** resigned.

C. J. Winslow, F. J. Schultz, H. D. Harvey, A. H. Noyes and **Grover Anderson,** in charge of the respective sales districts of the Electric Appliance Company, San Francisco, are at present at that city attending a sales managers' meeting.

R. H. Husbands, representative at Los Angeles; **S. H. Lanyon,** representative at Portland, and **W. H. Silver,** manager of the Seattle offices Pierson, Roeding & Co., are at present at San Francisco attending a managers' meeting of the company.

H. C. Goldrick, formerly Pacific Coast manager of Kellogg Switchboard and Supply Company, San Francisco, resigned that position to become associated with the Western Electric Company, San Francisco, effective January 1, 1915. Mr. Goldrick's headquarters will continue to be San Francisco.

Richard Sachse, chief engineer for the California Railroad Commission, and **George R. Maxwell,** assistant engineer, are at Los Angeles to start the valuation of the Southern California Edison Company's distribution system preliminary to condemnation by the municipality. Mr. Maxwell will have direct charge of the work, which will take at least six months to complete, as the company's entire system must be appraised, inasmuch as taking over the Los Angeles distribution system would depreciate the value of the generating stations and transmission lines, and the courts will probably allow corresponding damages.

H. W. Cope, formerly assistant manager of the industrial and power department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, has been appointed director of the Westinghouse exhibit for the Panama-Pacific International Exposition, and is now located at San Francisco, giving his personal attention to the work. Mr. Cope was born in North Vernon, Ind., and is a graduate of Purdue University of that state. Prior to his attending the university, he was engaged in electrical construction and sales work. In September, 1898, following his graduation, he became associated with the Westinghouse Electric & Manufacturing Company at East Pittsburgh, with which company he has remained ever since. Mr. Cope took the apprenticeship course, and was engaged in the engineering department in connection with the design of alternating current switchboards, layout of power houses and substations, and in 1905 was made the head of the a.c. correspondence department. A short time after this he was made assistant manager of the industrial and power department, which position he held until the time of his transfer to the work in connection with the Panama-Pacific Exposition.

MEETING NOTICES.

Oregon Society of Engineers.

At the regular meeting of the Oregon Society of Engineers on January 14th, Mr. E. A. West, efficiency engineer for the Portland Railway, Light & Power Company, will present a paper on mechanical tabulating methods.

Portland Section A. I. E. E. and N. E. L. A.

At a joint meeting of the Portland sections of the American Institute of Electrical Engineers and the National Electric Light Association on January 5th, O. B. Goidman presented a paper on "The Multiplex Cost and Rate System," in which he presented some novel views an electric rates. At the meeting of February 2d R. R. Robley will present a paper on "The Load Dispatching System of the Portland Railway, Light & Power Company."

The Jovian Electrical League of Southern California.

The closing session of the year 1914, held at Christopher's on December 30th, was well attended, and a number of out-of-town guests were introduced, among whom was Paul J. Ost, of the city engineer's office at San Francisco. Tribune Pieper announced that the Journal of Electricity, Power & Gas had volunteered, as they did last year, to publish gratuitously a roster of the local league, and the offer was accepted with thanks. Interesting three-minute talks were given by H. W. Allen on J. E. Wilson and G. E. Arbogast on Carl Johnson. The chairman of the day, H. C. McCutchan, then introduced Miss Margaret McKee, known as the Queen of Whistlers, who entertained those present with a number of tuneful selections. A very helpful and instructive lecture on "Does It Pay?" was then delivered by Colonel W. H. Holabird, receiver of the California Development Company, operating the largest irrigation system in this country. The speaker dwelt on the importance of the personal equation and value of thrift, and to illustrate his point he related personal reminiscences of his dealings with Claus Spreckels, who had an humble start, but always saved one-half of his earnings; E. H. Harriman, for whom the colonel had worked, and who always made a minute analysis of every problem and employed the most competent men, and Henry Miller, who owned 530,000 acres of California land, and who made good use out of the material wasted by others. The colonel was given a rising vote of thanks for his very helpful suggestions.

Joint Meeting of Jobbers and Contractors.

The electrical jobbers and contractors of San Francisco and vicinity met at dinner on Wednesday, December 9, 1914. Mr. H. C. Reid called the meeting to order by announcing that the object of the meeting was to get the jobbers and the contractors together monthly in an open meeting so that matters of interest to the trade could be discussed.

Mr. C. C. Hillis, manager of the Electric Appliance Company, was then introduced and read a paper on the "Evils of the Contracting Business From the Eyes of a Jobber." Mr. C. F. Butte, of the Butte Engineering & Electric Company, then spoke on "Standardization," and told what the association was trying to do along that line.

Mr. W. S. Berry, sales manager of the Western Electric Company, spoke on "Co-operation." Mr. Berry dealt on the many ways the contractors and jobbers could co-operate, and the willingness of the jobbers to co-operate. Another strong point that Mr. Berry brought out, and one which every contractor can well afford to pay attention to and use to the limit, was that the jobbers are maintaining a credit department that was at the disposal of their customers at all times.

The next speaker was Mr. George Brouillet, who gave an interesting talk on what the association could do for non-members. Mr. Brouillet spoke earnestly of the benefits he had derived from the association, and stated that he knew other contractors could obtain the same benefits.

The next speaker was Secretary W. S. Hanbridge who, in speaking of "Benefits of the Electrical Contractors' Association," reviewed the history of the assocaition; spoke of its early failure, and its present growth, enumerated a number of things they were doing and had done, and summed it all up that he could not se how a man in the electrical contracting business could afford to not be a member of the association.

Mr. W. Gribble, president of the Oakland association, then told of the good the association had done in Oakland. He stated that they had thirty members, and the meetings were being well attended. Mr. Lee Gilpin of Oakland, was then called upon and he spoke of the improvement of the retail business in Oakland since the central stations had discontinued the practice of selling lamps and appliances at cost.

Mr. W. L. Goodwin, vice-president and sales manager of the Facific States Electric Company, was called upon, and he stated that he had been given a subject by the secretary, but he now found himself the last speaker, his speech prepared in his pocket, but that all of the other speakers, including the secretary, had stolen his thunder. This did not seem to worry him very long, for within two minutes he was pounding away on the subject that is so close to his heart—improving the conditions of the electrical contractor and dealer. For two hours he demonstrated to the contractors their faults, and how every one of them could be corrected by joining the California Association of Electrical Contractors and Dealers, and help them co-operate with the jobbers to correct the evils of the business. Mr. Goodwin also pointed out the evils of the jobbing business and stated that it was necessary for the contractors to be associated to correct them. One of the principal points on which Mr. Goodwin dwelt was the electrical contractor and jobber who was so busy that he could not find time to attend association meetings. Mr. Goodwin claimed that it was utterly impossible for such men to keep abreast with the times and make a success of their business. Hearty applause was given Mr. Goodwin when he had concluded.

Mr. N. M. Hope of the Turner Company, was then called upon and he told what the contractors were going to do to entertain the National Electrical Contractors' Convention. Mr. L. R. Boynton of the Central Electric Company, in a few remarks, told the contractors that if they followed the advice given they would all be better off than the contractors of the present day.

Mr. H. C. Reid then announced that the speakers would be glad to answer any question any one desired to ask. The matter of extending credit was very earnestly discussed by Messrs. Sittman, Buzzell, Vitt, Brouillet, Goodwin and Berry. Mr. Butte stated that he would like to have all the contractors present as members of the association, so that they could assist in the work we are doing. Mr. Reid extended an invitation to be present at the Saturday meetings of the contractors.

The following were in attendance:

Jobbers.

Wm. Berry, Western Elec. Co.
O. Orrick, Western Elec. Co.
C. C. Hillis, Elec. Appliance Co.
W. L. Goodwin, Pacific States Electric Co.
Cass Gilson, Gilson Elec. Co.
D. F. Harris, Pacific States Electric Co.
Frank Killam, Brooks-Follis Elec. Co.
A. V. Olsen, Elec. Railway & Supply Co.

Oakland Contractors.

W. Gribble, Kimball Elec. Co.
Lee Gilpin, Piedmont Elec. Co.
R. King, King's Elec. Co.
R. L. Norling, Norling Elec Co.
N. Ellis, Oakland Electric Co.

San Francisco Contractors.

C. F. Butte, Butte Eng. & Elec. Co.
C. L. Chamblin, California Elec. Const. Co.
J. T. McDonald, California Elec. Const. Co.
L. R. Boynton, Central Electric Co.
Geo. Brouillet, Brouillet Elec. Co.
F. Buzzell, Buzzell Elec. Works.
W. A. Brewer, Buzzell Elec. Works.
A. H. Brainager, Rialto Electric Co.
O. Vitt, Vitt Elec. Works.
C. B. Kenney, NePage-McKinney Co.
C. J. Newberry, Mgr. Newberry F. E. Co.
N. M. Hope, Turner Company.
H. Hasselbach, Manhattan Elec. Co.
W. D. Kohlwey, Kohlwey Light Co.
Geo. Sittman, General Elec. Const. Co.
F. A. Sullivan, Bay Cities Eng. Co.
Geo. Smith, Elec. Motor & Eng. Co.
H. C. Reid, Pac. Fire Extr. Co.
W. W. Perry, Rex Elec. Const. Co.
W. S. Hanbridge, Elec. Contractors' Association.

TRADE NOTES.

The Seattle office of Hunt, Mirk & Company has closed a contract with the Granite Gold Mining Company of Valdez, Alaska, for its entire power plant equipment and transmission line.

Pierce-Tomlinson Company, Portland, Ore., have removed to larger quarters at 286 Oak street, which afford larger facilities for enlarging its retail business in electrical fixtures and supplies.

The Wagner Electric Manufacturing Company of St. Louis, Missouri, announces the opening of a sales office, January 1, 1915, in the Pioneer Building, Saint Paul, Minnesota, in charge of Mr. C. Kirk Hillman who for sometime has been identified with the sales of Wagner apparatus in this territory.

At Portland, Electrical Inspector Dunlap and Building Inspector Plummer have advanced a scheme which, instead of requiring electrical contractors and wiremen to put up a $100 cash bond and $500 security bond, as originally proposed in the electrical inspection ordinance, that all doing work file a registration fee of $25 or $10, depending on whether they are contractors or supervising electricians.

The Edison Storage Battery Company have secured 1500 feet of space in the Transportation Building of the Panama-Pacific International Exposition, located between the exhibits of the Ford Automobile and the Standard Oil Company. It is the purpose of the battery people to make an exhibit which will show the practical application of the storage battery to house lighting, train lighting and railroad signal systems, automobile service and the many other uses to which the battery is put. Edison Storage Battery Company advise of the recent placing in service by Wells, Fargo & Co. of three industrial trucks equipped with 42 cells each of A-6 Edison batteries. These trucks are in the baggage and package service at railroad terminal points in California; by the Panama-Pacific Exposition Company, five two-ton electric industrial trucks, with five en route for drayage purposes at the exposition; and the Standard Oil Company, at its Point Richmond Works, California, have placed in operation one two-ton industrial truck and one two-ton tractor. These machines are electrically operated by Edison storage batteries and are giving most satisfactory results from operating standpoint.

CALIFORNIA ASSOCIATION OF ELECTRICAL INSPECTORS

Section of N. A. E. I.

C. W. Mitchell, President. Arthur Kempston.
Wm. G. Pennycook, Vice-Pres. B. C. Hill, Executive Comm.
John W. Carrell, Secretary-Treasurer, 814 Scott, San Francisco.

The purpose of this organization is to standardize the common practice in electrical construction with the National Code as the general standard.

Questions pertaining to electrical construction will be answered in these columns, but only from the point of view of the Code. This is a voluntary organization and the answers published under this heading must not be construed as authoritative, or binding. No attempt will be made to correllate the answer from the several Inspection Districts, as an occasional difference of opinion will tend to induce further study on subjects. All questions will be passed upon by an executive committee.

Address all communications to the secretary.

Regular meeting of association will be held January 16th, at 2:30 p. m. in Department of Electricity, 55 Fulton Street, San Francisco. Subject: "Does Present Installation Cost Make the Use of Electricity Prohibitive?"

By the Secretary.

The present year, 1915, promises at least one event of importance to inside men. Prophets of electrical affairs announce a probable sprinkling of concentric wire installations throughout the United States before the close of the year. This means that, finally all wiring systems will center round the concentric method, if the prophecy be true. Of course the endorsement of the Underwriters must be secured first, but next March will tell the story.

The now celebrated paper by S. E. Doane, "The Successful Handling of the Small Consumer in Europe," contains much of interest from the inspector's viewpoint. An excerpt from this paper follows. When comparing European and American wiring methods it should be remembered that in Europe the frame building is an exception and some form of masonry construction the rule. It will be noticed that German wiring inspectors have troubles also:

Recently a system of wiring which is rapidly superseding other methods, especially in wiring existing buildings and in extensions of older installations where the installation must be made with as little disturbance and dirt as possible, has made its appearance. In this system two-conductor or three-conductor cable protected by thin brass or by thin lead-covered iron sheeting is used. The thickness of this sheet covering is about 1/100 in. The metal is pressed around the insulated wire or cable and the edges are folded over one another in such a way that a seam runs lengthwise of the wire. This seam, which is tightly pressed together, is water tight for all practical purposes, and, on the other hand, the metal cover which takes the place of metal tubes in other systems of wiring is in close contact with the insulation, without leaving a pocket for condensed water.

In cases of grounded return circuits the metal covering may be used as the return circuit, the carrying capacity of the metal covering having been considered in dimensioning the latter.

As the number of inside conductors of this kind of wire is one, two or three, the total number of conductors will be two, three and four respectively, in case the outer cover is used as a conductor also. Of course, the largest part of the material used is two-conductor wire, which means one or two inner wires, according to whether the outer cover is used as a conductor or not, and for small installations practically only such wire will have to be considered.

This kind of wire was invented a few years ago by Mr. Kuhlo, director of the electric central station in Stettin, and put on the market on a large scale by the Siemens-Schuckertwerke under the name "Kuhlo" wire. A year ago six or seven other firms—among them the Allegemeine Elektricitats Gesellschaft—took up the manufacture of this wire under the name of "Rohrdraht," which means tube wire.

This Kuhlo wire can be put up in a number of different ways, either buried in the wall or under the surface of the wall. The former is at present not permitted, according to the literal wording of the German rules, which were made before the general introduction of the Kuhlo wire, but in practice the scruples against burying wires in plaster do not seem to be shared generally, and many wiremen are concealing the Kuhlo wire when occasion demands. For this purpose a particular instrument, consisting of two 4 in. saws riveted together in parallel position so as to leave a space of about ¼ in. between them, is used. This double saw cuts a very nice, clean groove into the mortar on the wall, especially when guided by a straight edge. The Kuhlo wire can then be placed in this groove and plastered up.

In most cases, however, it is preferable to fasten the Kuhlo wire to the surface of the wall, not only for reasons of greater cheapness, but also because less disturbance and dirt will be caused that way in finished buildings with painted or papered walls. Kuhlo wire is unobtrusive in appearance, the thinnest wire with single conductor (capable of carrying 6 amperes under the German rules) having an outer diameter of only 4.3 mm, or less than 3/16 in. Moreover, this wire can be run in the corners of rooms or along the frames of doors, windows and picture molding, etc., thus rendering the installation less visible.

There are several methods in use for fixing Kuhlo wires to the surface of a wall, the simplest being to nail it down with proper staples. Other methods are permitted by the German rules, such as holding the wire down by straps which are made of brass-covered or lead-covered iron, in accordance with the material covering the Kuhlo wire. These straps have lugs on one side with holes in them. A piece of square steel of about 1¼ in. length is driven into the brick wall until it is flush with its surface. The strap mentioned above is then screwed down on the wall by means of a small iron machine screw into the center of the square piece of steel tapped for that purpose. Before screwing the strap down the Kuhlo wire is passed under it and then held in place. Instead of having rigid straps to fit the Kuhlo wire, flexible brass straps may also be used which are bent around the wire after one end is screwed onto the square piece of steel, as mentioned before. This has the advantage that the square pieces of steel can be driven into the wall along the path of the wire, whereas with the first-named type of straps the square pieces of steel have to be driven in about ⅜ in. or ½ in. to the side of that line. These flexible straps, which are rolled around the wire by hand, do not look quite as neat and tidy as the others, but are good enough, especially if cheapness is the first consideration.

By a third method the Kuhlo wire is held to the wall with little soft brass fork-shaped supports which also are screwed into the pieces of square steel and then pressed by means of pliers around the wire. On ceilings it is sometimes preferred to carry the wire about 2 in. or 2½ in. away from the surface, in order to avoid plastic ornaments which may happen to be on the ceiling.

The outlet boxes for residences are made of porcelain. Where mechanical abuse is likely, or in dusty places, metal outer boxes are used, consisting of cast iron bases with tight fitting brass covers kept in place by friction.

The porcelain fittings used for residence and other lighter work are of two types—one for soldered and the other for screwed connections. Both types have a sheet-brass base under the porcelain parts, which insures good electrical connection between the outer covers of all the wires entering into that outlet box, which connection, of course, is essential in case the metal coverings form part of the circuit. The connection between the sheet-brass base of the outlet boxes and the outer conductors of the Kuhlo wire is made in the same way as that of the inner conductors, namely, soldered or screwed, depending on the type of fitting used. The porcelain fittings, especially of the soldered type, are very small and unobtrusive in appearance.

As regards the necessary curvature of the wire, the smaller types of single and double conductor, which are almost exclusively used in ordinary house wiring, can be bent by hand. Stronger wires have to be bent by means of a special tool.

One of the great advantages of this method of wiring is its cheapness. When the method was new a prize competition was arranged and it was discovered that one wireman could run 200 ft, of Kuhlo wire a day. Since that time a record has been set of 600 ft. a day a wireman. Of course, the wiremen must be trained to the work and become thoroughly accustomed to it before proper comparisons as to the cost of wiring can be made.

Many other kinds of installations besides residences have been wired on the Kuhlo system, such as public buildings, theaters, churches, schools, hospitals, factories, agricultural establishments, offices, hotels, castles, villas, also ships and railway cars, and work of this kind is still increasing. Kuhlo wire is not found to any great extent outside of Germany.

NEWS NOTES

INCORPORATIONS.

SUMAS, WASH.—The Sumas Electric Lighting Company has been incorporated, with a capitalization of $37,500, by H. S. Bolcom, W. M. Bolcom, H. W. Vanderhoof and W. Yale Henry.

PHOENIX, ARIZ.—Articles of incorporation have been filed for the Falls Power & Electric Company, with a capital stock of $100,000. The directors are C. M. Etter, John Munson and A. G. Bailey. The company claims to have signed preliminary contracts with 250 or more owners and tenants of land which they are cultivating, and living in houses that will be supplied with electricity. Electricity for power and light will be secured from the reclamation service.

ALTURAS, CAL.—Articles of incorporation have been filed for the Union Gas Company with a capital stock of $75,000; 7500 shares at par value of $10 each, equally divided between C. C. Manker, R. R. Rice, H. H. Dunbar, J. McCosh Smith and Mrs. H. H. Dunbar. According to the papers filed the object of the corporation is the manufacture and installation of gas and gas machinery, plants to be installed in Susanville, Lassen county; Eagleville and Alturas, Modoc county. E. C. Bonner is acting as attorney.

ILLUMINATION.

SAN GABRIEL, CAL.—Bids are being taken by the board of trustees for installing a lighting system on Mission Drive from the Southern Pacific Railway tracks to Los Tunas Drive.

SANTA ANA, CAL.—The city council is considering the matter of lighting Fairview avenue between Main and Bristol streets.

WILLIAMS, CAL.—The Northern California Power Company has been communicated with in regard to lighting the streets of this town.

DALLAS, ORE.—The Oregon Power Company has submitted a contract to the council for consideration which includes a new system of street lighting.

IDAHO FALLS, IDAHO.—A new unit has just been added to the municipal lighting plant here. This gives the plant a generating capacity of 1800 h.p.

SANTA ANA, CAL.—A franchise for gas mains in the northwestern part of the county has been sold to Ferdinand R. Bain of the Southern Counties Gas Company.

MONMOUTH, ORE.—A proposition for better street lighting has been submitted to the council by A. L. Martin, local manager of the Oregon Power Company's business.

LUSK, WYO.—The special election held here to vote on the issuance of $8,000 bonds for the installation of a municipal electric lighting system, resulted in favor of the proposition.

TUCSON, ARIZ.—The election held here to vote on the issuance of $35,000 bonds for the installation of an ornamental street lighting system, resulted in favor of the proposition. L. O. Cowan is the city clerk.

SODA SPRINGS, IDAHO.—The special election held here to vote on the issuance of $15,000 bonds for the installation of a municipal electric lighting system, resulted in favor of the proposition. Paul Tipton is the city clerk.

OREGON CITY, ORE.—Gas service will soon be established in this city by the Clackamas County Gas Company, a subsidiary of the Portland Gas & Coke Company. Gas will be secured from the Linnton plant of the Portland company.

TULARE, CAL.—Bids for an electrolier system have been called for by the city council. The system will light 17 blocks in the central portion of the city. The electrolier district is the same as the district to be paved, and there will be six lights to the block, three on each side of the street.

LONG BEACH, CAL.—Bids for the installation of an ornamental lighting system in the district bounded by Alamitos, Broadway, Golden and Ocean avenues, were received as follows: Woodhill-Hulse Electrical Company of Los Angeles, $25,415; F. E. Newberry Electrical Company of $25,948; D. S. McEwan, $27,275; Chas. Glass, $30,640; Fred Hoffman, $31,500.

LOS ANGELES, CAL.—At a meeting of the board of supervisors contracts for street lighting in Newhall Lighting District and in the Barleigh Lighting District were awarded to the Southern California Edison Company. Reports on bids for improvement work in Westgate Lighting District and the report relating to a lighting system in Lankershim Lighting District, were taken under advisement.

NEWPORT BEACH, CAL.—The F. O. Engstrum Company of Los Angeles has the work well under way for the new city street lighting system ordered by the Board of Trustee last fall. One hundred and thirty-eight poles will be installed on all of the principal thoroughfares and cross streets on the bay and ocean fronts. The board has ordered the Newport Bay & Electric Light Company to remove their poles and wires from the city streets. This company formerly held the city lighting contract, but were succeeded by the Pacific Light & Power Corporation.

TRANSMISSION.

TULARE, CAL.—Bids are being taken for the installation of a conduit containing therein a single conductor cable in certain streets in this city.

TUCSON, ARIZ.—The contract for the construction of the Toole avenue and Tenth street electrical conduits has been awarded to Beotteger & Avery, who bid $1471.

ALAMEDA, CAL.—Six bids were received for furnishing a large quantity of weather-proof copper wire. The lowest bidder was the Electric Railway & Manufacturers' Supply Company. This firm will be awarded the contract.

SANTA FE, N. M.—The sum of $90,000 has been expended on the power project of the Socorro Mining & Milling Company in the Mogollon mining district, according to a report to the city engineer, who has given that company until January 25, 1917, to complete the work. About $90,000 more will be spent to complete the work.

VENTURA, CAL.—The Board of Supervisors has passed the forty-year franchise which was asked for by the Pacific Light & Power Corporation, which will bring in electric current by way of Chatsworth. The franchise gives the corporation the right to run lines and furnish power and light to the Simi Valley, the Las Posas and the Camarillo section and nearly to Saticoy.

BOISE, IDAHO.—The Washington Water Power Company has filed a complaint with the public utilities commission against the Montana Power Company, the Thompson Falls Power Company, the Federal Mining Company, and the Tamarack and Custer Consolidated Mining Company. They charge in the complaint that it is the intention of the mining companies which are now and have been for some time customers of the Washington Water Power Company, to purchase their power from the Montana concerns, which it is said, own and operate a generating plant at Thompson Falls, Montana, just across the State line. The complaint alleges that it is the belief of the complainant that contracts to this effect have already been signed. This proposition

presents an interesting problem to the commission, since it appears that ostensibly at least, the transmission line for supplying the power from the Montana plant to the Idaho mining companies will be built and owned by the mining companies, and the power is to be delivered at the Idaho state line. In this manner the power company, it appears, hopes to escape the necessity of applying to the commission for a writ of public convenience and of placing itself under the supervision of the commission. In making its plea, the Washington Water Power Company calls attention to the fact that it has complied with all the requirements of the commission and that it is willing further to abide by the decision of the commission in the rate cases which are now pending. It has an investment in Kootenai, Shoshone and Bonner counties of three million dollars and pays taxes of more than forty-six thousand dollars a year in Idaho. It is set forth that the Washington company has been supplying the needs of the mining companies of the section for the past ten years and that it is abundantly able to do so now. It then states a belief that the contracts with the Montana company have already been signed and that others are to be signed by other companies and that, if all this business is taken from the Washington Water Power Company, its property in this state will become valueless. Incidentally it states that some of these plants have enough commercial ore in sight to run more than ten years. There has been some work done on the dam at Thompson Falls but the plant is not yet finished, says the complaint, but it states that work is being rushed on the connecting transmission lines to reach into Idaho and that 75 men are working on these lines at this time. An injunction from completing the transmission lines into Idaho, denial of any certificate of public convenience and necessity and a requirement that all the defendants be ordered to disclose to the commission any contracts in existence between them and all correspondence on the matter, are requested by the Washington Water Power Company.

TRANSPORTATION.

SEATTLE, WASH.—Superintendent of Public Utilities Valentine, in a report to the mayor of the city, states that seventy-five out of every one hundred passengers in street cars in Seattle are furnished seats.

SAN FRANCISCO, CAL.—Municipal street car traffic has opened through the Stockton street tunnel. The new line runs from Market street to the Exposition grounds and Fort Mason, and will, Mayor Rolph declares, be continued through to the Townsend-street depot and the Potrero.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company has issued a statement to the effect that 483,000 passengers rode on its Whatcom-Skagit interurban trains during the year 1914. These trains were operated in the Bellingham-Mount Vernon Sedro-Wooley sections of Washington.

SEATTLE, WASH.—The Washington State Public Service Commission has reduced the passenger rate on the interurban line of the Pacific Northwest Traction Company between Everett, Wash., and this city from three to two cents a mile. The action is based on the claim of the commission that the company has been earning over thirteen per cent on a reasonable valuation of the property involved.

OAKLAND, CAL.—Beginning January 3d the Oakland, Antioch & Eastern Railroad added a fast passenger train to be known as the Sacramento Valley Limited, which will carry and obsertavion coach. By arrangement with the Northern Electric the O. A. & E. train, known as "The Comet," leaving San Francisco at 9 a. m. will make a direct connection at Sacramento for all points on the Northern Electric.

BERKELEY, CAL.—The District Court of Appeals has handed down a decision overruling the demurrer of the Key Route to the order that the corporation must pave Grove street from Allston Way to Woolsey street in Berkeley. In the decision the court recognized a stipulation to the effect that the dispute be submitted to a referee and also expressed a willingness to appoint a referee agreeable to both sides.

CLARKSTON, WASH.—The council granted a franchise to A. G. Nortz and associates permitting the construction and operating of an electric railway from Lewiston-Clarkston bridge through the streets of the city. R. C. Dahlhjelm, local representative of the project, states that work on the bridge will be begun within a few weeks. Electrical concerns will submit bids at once for the equipment which will cost approximately $15,000. The approximate cost of the system in the valley will be $750,000. Franchises were previously granted in Lewiston and over the interstate bridge.

FRESNO, CAL.—The Fresno Traction Company has been granted franchises along Fresno avenue and Fresno street, from Belmont to J street, and along J street to San Diego; along Stanislaus from O to J street, and along J to Fresno; along Tulare street from P street to the Southern Pacific reservation; along Mariposa street, from J to H. The company paid $125 for the franchise and will pay 3 per cent of the gross income from the time the franchise is accepted.

TELEPHONE AND TELEGRAPH.

ALAMEDA, CAL.—The Pacific Telephone & Telegraph Company has been awarded a franchise by the city council, the action ending a consideration of 18 months. The franchise is for a term of 41 years and in exchange the company will give the city 2 per cent of the gross receipts, 35 free telephones, the amount of percentage which has accrued since the former franchise expired, and several other concessions of lesser nature, included among which are the establishment of an office in the Park street business section and the extension of the service to Bay Farm island if residents there so desire.

WATERWORKS.

SUNNYVALE, CAL.—Engineer Nikirk has presented plans and specifications for a water system.

LOS ANGELES, CAL.—Upon application of the South Los Angeles Water Company for a franchise for water pipe lines the county counsel has been requested to prepare notice of sale of franchise.

MANILA, P. I.—Sealed bids will be received at the office of Provincial Treasurer Batangas up to February 8th, for furnishing labor and equipment for the construction at the municipality of Taal of a water system to be known as Taal Water Works.

LOS ANGELES, CAL.—The Walnut Grove Water Works, operating in Los Angeles county, has applied for a certificate of public convenience and necessity authorizing it to extend its system into certain territory near the city of Huntington Park.

SPRINGER, N. M.—State Engineer French has received proof of the completion of the works of the Jaritas Ditch & Reservoir Company east of this city. The work includes a storage reservoir and extensive diversion works, also an irrigation canal.

MILWAUKEE, ORE.—The bids for laying three miles of water mains to connect up with the Bull Run water system were opened and the low bidder was Giebisch & Jeplin at $16,469. A temporary injunction has been issued restraining them from entering into a contract.

OREGON, CITY, ORE.—It is reasonably certain that Estacada will make an attempt to secure water from the pipe line connecting Oregon City with the south fork of the Clakamas if that line is built. The sentiment of the Estacada people is in favor of a pipe line to furnish better water.